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PROJECT MANAGEMENT SUCCESS FACTORS: IN SEARCH OF PRODUCT DEVELOPMENT PROJECT SPECIALITIES

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Abstract: Project success is a multifactorial issue, including difficult to quantify, soft factors as well. Project management style, collaboration within the team, and the level of standardisation may have an essential influence on the deliverables, moreover, on corporate performance. A prescription answer is not achievable considering the individual characteristics of projects but finding best practices and critical factors help to improve the performance. This paper presents the results of a survey among product development project experts (n = 112) evaluating the relevance of some success factors and their practical experience in the field. The results show that keeping the project plan and managing long-term issues like lessons learned database or module database are the most critical factors of success. The analysis did not find patterns of the responses that confirms the need for unique management actions.

Keywords: *project success, product development process, expert survey, IPA analysis*

1. INTRODUCTION

Companies, to keep competitiveness, must continuously find new and newest ways for creative and cost-efficient solutions. [1] One of the main goals of a company is to bring products to the market, whose performance and behaviour in providing this performance is desired by customers and users, and which, due to these characteristics, help the company to achieve continuously high profitability and financial stability, high acceptance by all social groups and possibly also market leadership. [2] Evolution of product development methods and processes are aligning into the clear cue, or we can say the direction of improvement is going into some main direction:

- Reduction of time of products development project, parallel this reduce cost what is spent to development. In the case of shorter development time cause quicker payback of development costs for the corporation. A further advantage to be on the market earlier thank competitors can increase profitability dramatically in the case of 'hungry' market.
- Cost planning of product development projects is a key factor already from the start. [3] Due to the reduction of cost and development time payback period of investment of new product also reduce significantly.

- Increase of fulfilment of market needs and customer demands. One of the most critical objective of product development and the entire company to be on the market with products what exactly can cover customer demands as much as possible. This is the substance of professional product development.
- Improvement od product and process quality for entire supply chain and production. A high level of quality is just a 'must' but not an advantage. During the execution of the project, there is no way to make any concession of quality, the only way to change timing or cost if any fine-tuning is necessary even lightening of quality level can be an easier way to deliver product development project [3].

Although each project is a temporary endeavour undertaken to create a unique product, service, or result [4], due to market and corporate specifics, it is worth to analyse the lessons and develop the project management practices. It is not possible to determine with engineering accuracy the tasks and tools required for the success of the project, but the development of skills in the field can significantly contribute to managing the emerging risks and opportunities. The goal of the paper is to examine project management success according to product development processes.

2. PROJECT SUCCESS FACTORS

Project success is designated by the quality of results, budget, and timeframe [5] [6]. There are several factors which affect one or more of these factors. According to the stakeholder theory, project success can be evaluated on the satisfaction of the stakeholders [7] [8]. However, it is a great challenge to find the proper weights of the stakeholders' expectations. Baccarini [9] highlights beyond the project management success, the product success covering the organisational expectations as a success factor. There is a change of focus point over time. The emphasis is moved from project management success (in the 1960s–1980s) to project/product success (in the 1980s–2000s) then to project/product, portfolio, and program success and narratives of success and failure in the 21st century [10].

The success of the project can be described and controlled by quantifiable indicators but achieving them are largely depending on leadership and management style [11]. A thorough investigation of collaboration between the project team, or the level of trust may bring to a closer understanding of project success [12] [13].

Moreover, knowledge integration capability [14] must also be considered. It is to note managing project knowledge appears asymmetrically. Of course, each project profits from previous lessons and welcomes the available information but generating explicit knowledge for the future requires additional efforts, and it is not acknowledged when created.

Best practices and pieces of evidence allow us to rethink and refine the influencing factors of project success, but there is no prescription answer. Targeted research activities that can contribute to expanding the knowledge base and re-check the previously established models are essential to improving project success. This paper investigates the opportunities according to product development projects.

3. METHODS AND LIMITATIONS

An online survey was conducted among product development experts in 2020. Assuming that project management is determinative in achieving project success, the survey included a list focusing on the project management responsibly. The experts were asked to evaluate the importance of the items on a 5-point scale (1: not important at all, 5: essential). Other questions of the survey asked to evaluate the performance of these issues. The comparison of the importance and performance allows exploring the most critical factors. Survey items are summarised in *Table 1*, including the sample sizes. The evaluation of importance is based on 112 responses in each case, but performance is not evaluated if the topic is not managed by the corporation.

Table 1
Factors of analysis

Factor	Note	sample size (performance)
Availability of written standards	Access and understanding to rules and expectations	112
Review of written standards regularly	Regular update in line with changes	112
Defined project goals	Clear and written goals known by who is concerned	112
Keeping the project plan	Frequency of changes in the plans	112
Feedback	The utilisation of former experiences	112
Project meetings	Average evaluation of the usefulness	112
Teamwork	Collaboration between the project team members	112
Managing lessons-learned	Availability and utilisation of a lessons-learned dataset	76
Managing module-database	Availability and utilisation of a module dataset	64
Involvement of production	Collaboration between the project and the representatives of production	112
Active attention of the project manager	The activity of project manager according to team and tasks.	112

The results of the survey are presented by the mean values of the evaluations including the standard deviations, and an IPA (importance-performance analysis) matrix based on the work of Marilla and James [15]. The correlation between the factors is

measured with the Spearman correlation coefficient [16]. Data analysis is supported by IBM SPSS 25.

The research presented in this paper cannot be considered as a complete or representative survey in the field of project management of product development, but the results are based on the responses of practising professionals of various corporations. Their opinion may be relevant in exploring critical problems.

4. RESULTS

4.1. Evaluation of project management success factors

The well-defined project goals (mean value 4.87 on the 5-point scale) and cooperation of the project team (4.84) are ranked the most relevant success factors. Review of the standards (3.87), managing the lessons learned from the project (3.84) and managing module databases (3.78) are at the bottom of the list *(Figure 1)*.

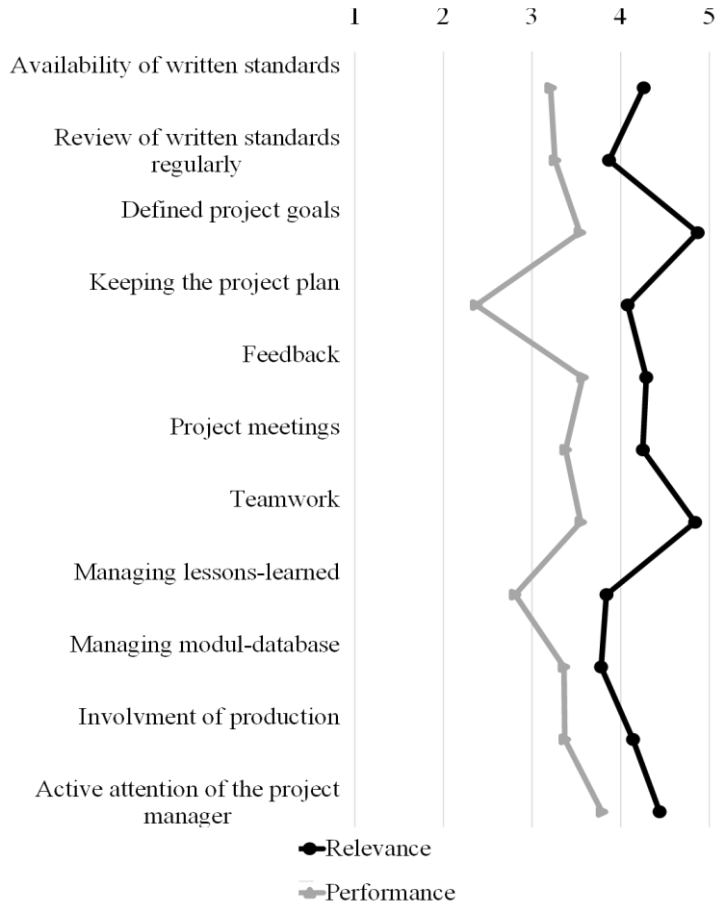

Figure 1

Survey results measured on a 5-point scale

The performance evaluation of the items shows two outlier values. Modification of the specifications is a common feature of the project (mean value is 2.37, lower value means more frequent need for changes). On the other hand, managing lessons learned (2.81) is rated lower than the medium value. Based on the distances between the evaluation of relevance and performance, the issues of well-defined goals, keeping the project plans and teamwork show the highest differences. In general, the distances by evaluation factors presented in *Figure 1* suggest that factors with the highest importance are in line with higher differences between relevance and performance. An exception is according to keeping the project plan.

That suggests that project management success is mainly focused on the short term (i.e., the interest of the current project overwrites other issues) in the view of the experts; corporate-level impacts are less important.

4.2. IPA analysis

The importance-performance analysis allows to point out the critical factors visually. Since the aspect of importance is rated to the high field in each case (all mean values are higher than the medium), *Figure 2* is zoomed. The performances in 9 of 11 factors investigated are between the values 3 and 4, which refers to a good performance. However, excellent ratings (performance indicator around 5) are missing.

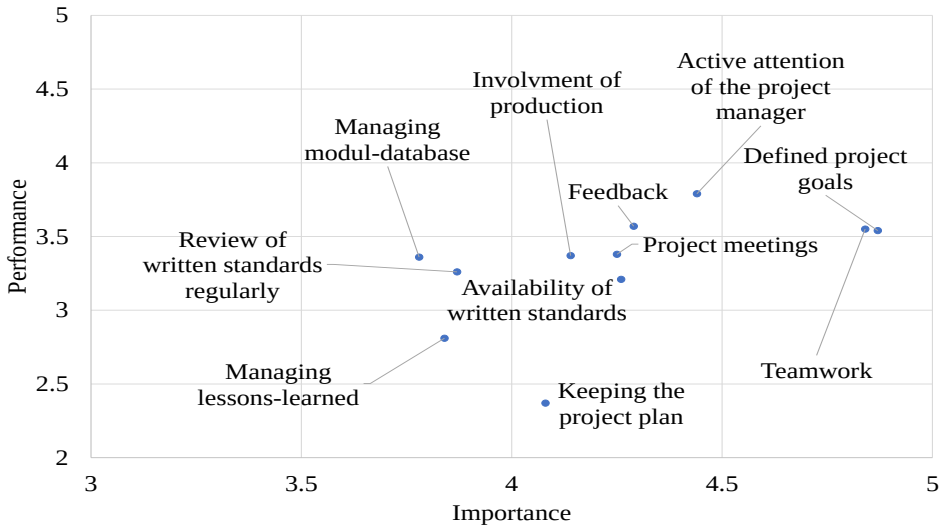

Figure 2
Importance-performance evaluation of project success factors

Based on the relative positions of the factors, managing lessons learned and keeping the project plan can be considered as the most critical ones. The strengths of project management are the active focus of the project manager both on the team and the progress. Information flow also has a good relative position within the project (feedback and the evaluation of project meetings), but the performance values clearly

point out the need for development. Since the performance evaluation of the factor do not reach the value of 4 in any cases that highlights the wide range of development opportunities.

4.3. Correlation analysis

Assuming that behavioural patterns may promote the development of project management practices, the correlations between the success factors means the basis for further analysis. The following tables present the non-parametric correlations between the survey results:

- Table 2 Correlations between the items, relevance evaluation,
- Table 3 Correlations between the items, performance evaluation,
- Table 4 Correlations between the relevance and performance evaluation.

Based on the responses, the results of 2-tailed correlation analysis are significant if those are marked:

- at the 0.01 level (**), and
- at the level 0.05 (*).

Table 2

Spearman-correlations between the survey items, relevance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Availability of written standards (1)	1	.570**	0.116	0.14	0.121	-0.092	-0.054	.213*	.230*	.237*	0.077
Review of written standards regularly (2)		1	0.016	0.14	.198*	-0.089	0.176	.341**	0.183	.300**	0.089
Defined project goals (3)			1	0.155	0.164	0.051	-0.045	0.081	0.035	0.024	-0.006
Keeping the project plan (4)				1	.326**	0.009	0.162	0.057	.214*	0.172	.228*
Feedback (5)					1	0.072	-0.139	.316**	0.158	0.165	0.096
Project meetings (6)						1	0.152	0.006	0.125	0.13	0.157
Teamwork (7)							1	0.096	0.178	.322**	0.068
Managing lessons-learned (8)								1	.391**	.336**	0.068
Managing module-database (9)									1	.347**	-0.004
Involvement of production (10)										1	0.026
Active attention of the project manager (11)											1

Table 3

Spearman-correlations between the survey items, performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Availability of written standards (1)	1	.614**	.399**	-0.078	.407**	.543**	.329**	.460**	.276*	.259**	.468**
Review of written standards regularly (2)		1	.374**	-.221*	.361**	.409**	.249**	.581**	.434**	.360**	.338**
Defined project goals (3)			1	-.229*	.335**	.464**	.293**	.294**	0.221	.383**	.310**
Keeping the project plan (4)				1	-0.131	-.197*	-0.013	-0.187	-0.034	-0.069	-0.09
Feedback (5)					1	.517**	.260**	.484**	.258*	.293**	.387**
Project meetings (6)						1	.355**	.499**	.319*	.196*	.396**
Teamwork (7)							1	.319**	.255*	0.145	0.119
Managing lessons-learned (8)								1	.526**	.327**	.500**
Managing module-database (9)									1	0.163	.281*
Involvement of production (10)										1	.229*
Active attention of the project manager (11)											1

Table 4

Spearman-correlations between relevance and performance by survey items

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Availability of written standards (1)	-0.039	0.054	0.088	0.178	-0.035	0.115	.238*	0.032	0.03	0.136	-0.009
Review of written standards regularly (2)	-0.002	0.122	0.172	0.183	0.091	0.113	0.084	0.049	0.046	0.166	0.015
Defined project goals (3)	-0.098	0.091	0.169	.265**	0.127	.212*	0.159	0.138	-0.094	0.072	.193*
Keeping the project plan (4)	0.124	-0.027	-0.083	0.066	0.008	-0.037	-0.002	0.144	0.053	-0.018	0.115
Feedback (5)	-0.155	0.061	0.099	0.152	0.117	0.004	0.018	0.053	-0.049	-0.127	-0.106
Project meetings (6)	-0.091	0.125	0.117	0.145	-0.027	.210*	.188*	-0.025	-0.048	0.074	-0.008
Teamwork (7)	-0.091	-0.022	-0.042	0.04	-0.058	0.155	0.166	-0.003	-0.003	0.021	0.052
Managing lessons-learned (8)	0.151	0.205	.352**	0.154	0.1	0.038	-0.04	0.2	0.131	-0.002	-0.04
Managing module-database (9)	-0.045	0.021	0.058	0.083	-0.034	0.041	-0.082	0.087	-0.084	0.076	0.085
Involvement of production (10)	-0.086	0.043	-0.016	.218*	0.08	0.015	.228*	0.185	0.14	.241*	0.13
Active attention of the project manager (11)	0.165	.368**	0.142	.300**	.290**	0.052	0.157	.211*	0.181	.241*	0.125

According to the evaluation of importance, there are few significant and high-value correlations. This suggests that the factors are parallelly crucial for project success. Theoretically, exploring patterns of the evaluations is feasible by cluster analysis, but the analysis did not find relevant grouping opportunity. This result confirms that all factors are important; however, this also can be a result of the fact that the experts ranked all importance items high. The diagonal values of the correlation analysis between the importance and performance factors show significant results in two cases (project meetings and the involvement of production). Performance evaluation shows significant and high correlations. Cluster analysis was conducted to explore patterns based on the responses, after dimension reduction of the data by principal component analysis. Still, grouping must have been rejected in this case as well.

5. CONCLUSION

Although the purpose of a project is to contribute to improving corporate performance by framing the changes systematically, projects also can be considered as individual units. The latter approach means the effectiveness and efficiency of project management will be evaluated and accounted for on a project-by-project basis. Project managers and team members are rewarded or punished by the project performance that may hinder a broader approach to success. In the case of product development projects, this more comprehensive approach would be particularly important because these determine further project initiations.

Understanding project management characteristics include several soft factors. These are difficult to measure with an engineering approach, but experience supports the consideration of them. The survey results confirm that the long-term approach is less important based on the evaluations of the experts in the field. The selected success factors of the survey are all rated quite relevant, and the performance evaluation show shortcoming compared to the importance. Literature [4] [17] emphasises the utilisation of former project experience is essential for saving time, cost and reducing

the risks of a project. The survey does not confirm the excellence of practical applications. Managing module-databases and especially lessons-learned, are among the most critical factors in the survey.

Beyond this, the specification in project plans are often changing, but these changes are considered quite usual (relevance of keeping the project plans is rated relatively low compared to other factors). It is to note, that in the meanwhile the need for well-defined and well-understood project goals are considered among the most important factors.

Endeavours to find patterns of the opinions are failed. This suggests that the opinions and the problems which the experts meet are diversified. In terms of development opportunities of the tools of product development project, an extensive generalisation is available.

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REFERENCES

[1] Soltész, L. (2019). Product development project of high performance electrical power pilot valve in practice. *GÉP Journal*, Vol. 70, No. 4, pp. 21–25., ISSN 0016-8572.

[2] Vajna, S. (ed.) (2020). *Integrated Design Engineering – Interdisciplinary and Holistic Product Development*. Heidelberg, Springer Nature, ISBN 978-3-030-19356-0.

[3] Soltész, L., Berényi, L., Kamondi, L. (2020). Analysis and assessment of the product development process. *GÉP Journal*, Vol. 71, No. 3–4, pp. 61–71., ISSN 0016-8572.

[4] *Project Management Body of Knowledge* (2017). 6th Edition, Project Management Institute, Newtown Square, ISBN 978-1-62825-184-5.

[5] Görög M. (2019). *Projektvezetés a szervezetekben*. Budapest, Panem Kiadó, ISBN 978-9-63545-537-9.

[6] Aranyossy, M., Blaskovics, B., Horváth Á. A. (2018). How universal are IT project success and failure factors? Evidence from Hungary. *Information Systems Management*, Vol. 35, No. 1, pp. 15–28., ISSN 1058-0530.

[7] Eskerod, P., Huemann, M., Savage, G. (2015). Project stakeholder management: past and present. *Project Management Journal*, Vol. 46, No. 6, pp. 6–14., ISSN 8756-9728.

[8] Ligetvári É., Berényi L. (2013). A project érintettjeinek kezelése. *Magyar Minőség*, Vol. 22, No. 7, pp. 11–19., ISSN 1789-5510.

[9] Baccarini, D. (1999). The Logical Framework Method for Defining Project Success. *Project Management Journal*, Vol. 30, No. 4, pp. 25–32., ISSN 8756-9728.

[10] Ika, L. A. (2009). Project Success as a Topic in Project Management Journals. *Project Management Journal*, Vol. 40, No. 4, pp. 6–19., ISSN 8756-9728.

[11] Horváth V. (2019): Projektmenedzsment kompetencia – Definíciók, modellek, standardok és a gyakorlati alkalmazás lehetőségei. *Vezetéstudomány*, Vol. 50, No. 11, pp. 2–17., ISSN 0133- 0179.

[12] Henderson, L. S., Stackman, R. W., Lindekilde, R. (2016). The centrality of communication norm alignment, role clarity, and trust in global project teams. *International Journal of Project Management*, Vol. 34, No. 8, pp. 1717–1730., ISSN 0263-7863.

[13] Bond-Barnard, T. J., Fletcher, L., Steyn, H. (2018). Linking trust and collaboration in project teams to project management success. *International Journal of Managing Projects in Business*, Vol. 11, No. 2, pp. 432–457., ISSN 1573-8378.

[14] Todorović, M. L., Petrović, D. Č., Mihić, M. M., Obradović, V. L., Bushuyev, S. D. (2015). Project success analysis framework: a knowledge-based approach in project management. *International Journal of Project Management*, Vol. 33, No. 4, pp. 772–783., ISSN 0263-7863.

[15] Lin, S. P., Chan, Y. H., Tsai, M. C. (2009). A transformation function corresponding to IPA and gap analysis. *Total Quality Management & Business Excellence*, Vol. 20, No. 8, pp. 829–846., ISSN 1478-3363.

[16] Georg, D., Mallery, P. (2019). *IBM SPSS Statistics 26 Step by Step: A Simple Guide and Reference IBM SPSS Statistics 26 Step by Step: A Simple Guide and Reference*. London, Routledge, ISBN 978-036717-435-4.

[17] *The Standard for Portfolio Management*. 4th Edition, Newtown Square, Project Management Institute, ISBN 978-162825-197-5.